



AMENDMENTS

In the Claims:

Please AMEND the claims as follows:

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Please note, that the brackets ("[]") and underlining ("____") are made relative to the claims of the issued patent, not relative to the claims as last amended.

- 1 1. (Six Times Amended)¹ A method for dewatering biological sludge that has been digested by
2 a thermophilic digestion process at a temperature greater than about 115°F, comprising:
3
4 a. adding a polymeric quaternary ammonium compound[s], as primary component, to the
5 biological sludge; and
6
7 b. adding a polyacrylamide to the biological sludge;
8
9 such that any combination[s] of the polymeric quaternary ammonium compound[s] and of the
10 polyacrylamide[s] enhances dewatering of the sludge.
- 1 2. (Four Times Amended) The method for dewatering biological sludge according to claim 1,
2 wherein the polymeric quaternary ammonium compound[s are] is from the di-allyl di-methyl
3 ammonium chloride (DADMAC) family.
- 1 3. (Five Times Amended) The method for dewatering biological sludge according to claim 1,
2 wherein the polymeric quaternary ammonium compound[s are] is [from] epichlorohydrin

¹ The "times amended" is based on the following amendments:
(1) Reissue Amendment of 12/05/00 amended claims 1-3, 15, and 17-19;
(2) Reexamination Amendment of 2/5/01 amended claims 1 and 15;
(3) the "housekeeping" amendment of 4/18/01 amended claims 1-3, 15-19 (with 19 renumbered as "20" by the Examiner;
(4) the Combined Proceedings Amendment of 3/1/01 amended claims 1-7, 9, 10, 12, 13, 15, 16, 19 and 21;
(5) the Combined Proceedings Amendment of 3/4/01 amended claim 21;
(6) the Instant Amendment, amending claims 1-10, 12, 13, 15 and 16.

1 di-methyl amine (epi-DMA) [family].

1 4. (Two Times Amended) The method for dewatering biological sludge according to claim 1,
2 wherein the polymeric quaternary ammonium compound is added directly to the sludge and,
3 upon formation of microflocs of the sludge from the polymeric quaternary ammonium
4 compound, wherein the polyacrylamide is a cationic polyacrylamide and is added to form
5 a floc that dewateres the sludge.

1 5. (Twice Amended) The method for dewatering biological sludge according to claim 4,
2 wherein the polymeric quaternary ammonium compound and the cationic polyacrylamide
3 are in an approximately 1:1 ratio, with the cationic polyacrylamide having a higher molecular
4 weight than the polymeric quaternary ammonium compound does.

1 6. (Twice Amended) The method for dewatering biological sludge according to claim 4,
2 wherein ratio[s] of the polymeric quaternary ammonium compound with respect to the
3 cationic polyacrylamide ranges from about 1:10 to about 20:1.

1 7. (Twice Amended) The method for dewatering biological sludge according to claim 4,
2 wherein the polymer concentration to solids ratio of total polymer dosage requirement in
3 relationship to percentage of solids component of the sludge is between about 50 ppm:1
4 percent and about 300 ppm:1 percent.

1 8. (Amended) The method for dewatering biological sludge according to claim 1, wherein the
2 polymeric quaternary ammonium compound is added directly to the sludge, in an amount
3 sufficient to cause formation of a cationic overcharge within a developed microfloc system,
4 [and an] wherein the polyacrylamide is a anionic polyacrylamide [is then] added for final
5 floc formation.

1 9. Cancelled.

1 10. (Twice Amended) The method for dewatering biological sludge according to claim 8,
2 wherein the polymeric quaternary ammonium compound and the anionic polyacrylamide are
3 in an approximately 10:1 ratio, with the anionic polyacrylamide having a higher molecular
4 weight than the polymeric quaternary ammonium compound [does].

1 11. The method for dewatering biological sludge according to claim 10, wherein the anionic
2 polyacrylamide is about 40% anionic.

1 12. (Twice Amended) The method for dewatering biological sludge according to claim 8,
2 wherein ratio[s] of the polymeric quaternary ammonium compound to the anionic
3 polyacrylamide ranges from about 1:10 to about 20:1.

1 13. (Twice Amended) The method for dewatering biological sludge according to claim 8,
2 wherein polymer concentration to solids ratio of total polymer dosage requirement in
3 relationship to percentage of solids component of the sludge is between approximately 50

1 *DS*

ppm:1 percent and approximately 300 ppm:1 percent.

DS

- 1 14. The method for dewatering biological sludge according to claim 1, wherein the biological
2 sludge is mixed with primary sludge.

- 1 15. (Six Times Amended) A composition comprising [for dewatering] biological sludge that has
2 been digested by a thermophilic digestion process at a temperature greater than about 115°F,
3 comprising polymeric quaternary ammonium compound[s], as primary component, and
4 polyacrylamide, said components being present in the composition in a ratio to enable [the
5 composition to function as an agent for] dewatering of the biological sludge [from a
6 thermophilic digestion process].

- 1 16. (Three Times Amended) The method for dewatering biological sludge according to claim
2 1, wherein the polyacrylamide and the polymeric quaternary ammonium compound[s are]
3 is used in solution or in dry form.

- 1 17. Cancelled.

- 1 18. Cancelled.

DS

- 1 19. (Amended) The method of claim of claim 16 wherein the polyacrylamide is cationic or
2 anionic.

- NEI* 20. (New) The composition of claim 15 wherein the polyacrylamide is cationic or anionic.

- 1 21. Cancelled.
2

Please ADD the following claims 22-71:

- 1 22. (Amended) A method for treating a sludge comprising water and solids, wherein the solids
2 comprise thermophiles, wherein the thermophiles comprise bacteria living at temperatures
3 of greater than about 115°F, the method comprising:
4

5 contacting the sludge with a polymeric quaternary ammonium compound and a
6 polyacrylamide to form a treated sludge;
7

8 wherein the contacting of the sludge with the polyacrylamide and polymeric quaternary ammonium
9 compound is simultaneous, or the contacting of the sludge is first with the polymeric quaternary
10 ammonium compound and then with the polyacrylamide.

- 1 23. **PLEASE CANCEL THIS CLAIM**

- 1 24. (New) The method of claim 22, wherein the polymeric quaternary ammonium compound

1 comprises a molecular weight in the range of about 500,000 to about 3,000,000, and the
2 polyacrylamide comprises a molecular weight in the range of about 5,000,000 to about
3 15,000,000.

1 25. (New) The method of claim 22, wherein the polymeric quaternary ammonium compound is
2 added in an amount sufficient to form microflocs of the thermophiles; and wherein the
3 polyacrylamide is added in an amount sufficient to agglomerate the microflocs into flocs for
4 dewatering.

1 26. (Amended) The Method of claim 25 wherein the polymeric quaternary ammonium
2 compound comprises at least one selected from the group consisting of di-allyl di-methyl
3 ammonium chloride (DADMAC) compounds and epichlorohydrin di-methyl amine
4 (epi-DMA).

1 27. (New) The method of claim 25, wherein ratio of the polymeric quaternary ammonium
2 compound to the cationic polyacrylamide is in the range of about 1:10 to about 20:1.

1 28. (Amended) The method of claim 25, wherein a concentration of quaternary ammonium
2 compound and polyacrylamide to the percentage of solids in the sludge is in the range of
3 about 50 ppm:1 percent to about 300 ppm:1 percent.

1 29. (New) The method of claim 22, wherein the polymeric quaternary ammonium compound is
2 added in an amount sufficient to cause formation of the thermophiles into a developed
3 microfloc system having a cationic overcharge, and wherein the anionic polyacrylamide is
4 added for final floc formation.

1 30. (Amended) The Method of claim 29 wherein the polymeric quaternary ammonium
2 compound comprises at least one selected from the group consisting of di-allyl di-methyl
3 ammonium chloride (DADMAC) compounds and epichlorohydrin di-methyl amine
4 (epi-DMA).

1 31. (New) The method of claim 29, wherein ratio of the polymeric quaternary ammonium
2 compound to the cationic polyacrylamide is in the range of about 1:10 to about 20:1.

1 32. (Amended) The method of claim 29, wherein total concentration of quaternary ammonium
2 compound and polyacrylamide to the percentage of solids in the sludge is in the range of
3 about 50 ppm:1 percent to about 300 ppm:1 percent.

1 33. (Amended) A method for treating a sludge comprising water and thermophiles, wherein the
2 thermophiles comprise bacteria living at temperatures greater than about 115° F, the method
3 comprising:

4 adding to the sludge a polymeric quaternary ammonium compound.

1 34. (Amended) The method of claim 33, wherein the polymeric quaternary ammonium

1 compound comprises a molecular weight in the range of greater than about 5,000,000.

1 35. (Amended) The method of claim 33, wherein the polymer is added in an amount sufficient
2 to form microflocs of the thermophiles.

1 36. (Amended) The method of claim 35 wherein the quaternary ammonium moiety comprises at
2 least one selected from the group consisting of di-allyl di-methyl ammonium chloride
3 (DADMAC) compounds and epichlorohydrin di-methyl amine (epi-DMA).

1 37. (Amended) The method of claim 35, wherein a concentration of polymer to the percentage
2 of solids in the sludge is in the range of about 50 ppm:1 percent to about 300 ppm:1 percent.

1 38. (Amended) The method of claim 33, wherein the polymer is added in an amount sufficient
2 to cause formation of the thermophiles into a developed microfloc system having a cationic
3 overcharge, and wherein the anionic polyacrylamide is added for final floc formation.

1 39. (Amended) The method of claim 38 wherein the quaternary ammonium moiety comprises at
2 least one selected from the group consisting of di-allyl di-methyl ammonium chloride
3 (DADMAC) compounds and epichlorohydrin di-methyl amine (epi-DMA).

1 40. (Amended) The method of claim 38, wherein a concentration of polymer to the percentage
2 of solids in the sludge is in the range of about 50 ppm:1 percent to about 300 ppm:1 percent.

1 41. (Amended) A sludge composition comprising:
2 water;
3 polyacrylamide;
4 a polymeric quaternary ammonium compound; and
5 solids comprising thermophiles, wherein the thermophiles comprise bacteria living at
6 temperatures greater than about 115°F.

1 42. PLEASE CANCEL THIS CLAIM

1 43. PLEASE CANCEL THIS CLAIM

1 44. (Amended) The sludge of claim 41, wherein the polymeric quaternary ammonium compound
2 comprises at least one selected from the group consisting of di-allyl di-methyl ammonium
3 chloride (DADMAC) compounds and epichlorohydrin di-methyl amine (epi-DMA).

1 45. (Amended) The sludge of claim 41, wherein a ratio of the polymeric quaternary ammonium
2 compound to the polyacrylamide is in the range of about 1:10 to about 20:1.

1 46. (Amended) The sludge of claim 41, wherein a concentration of quaternary ammonium
2 compound and polyacrylamide to the percentage of solids in the sludge is in the range of
3 about 50 ppm:1 percent to about 300 ppm:1 percent.

1 47. (New) The sludge of claim 41, wherein, wherein the polymeric quaternary ammonium
2 compound comprises a molecular weight in the range of about 500,000 to about 3,000,000,
3 and the polyacrylamide comprises a molecular weight in the range of about 5,000,000 to
4 about 15,000,000.

1 48. (Amended) A sludge composition comprising:
2 water;
3 a polyacrylamide;
4 a polymeric quaternary ammonium compound; and
5 solids comprising microflocs of thermophiles wherein the thermophiles comprise bacteria
6 living at temperatures greater than about 115°F.

1 49. PLEASE CANCEL THIS CLAIM

1 50. PLEASE CANCEL THIS CLAIM

1 51. (Amended) The sludge of claim 48, wherein the polymeric quaternary ammonium compound
2 comprises at least one selected from the group consisting of di-allyl di-methyl ammonium
3 chloride (DADMAC) compounds and epichlorohydrin di-methyl amine (epi-DMA).

1 52. (Amended) The sludge of claim 48, wherein a ratio of the polymeric quaternary ammonium
2 compound to the polyacrylamide is in the range of about 1:10 to about 20:1.

1 53. (Amended) The sludge of claim 48, wherein a concentration of quaternary ammonium
2 compound and polyacrylamide to the percentage of solids in the sludge is in the range of
3 about 50 ppm:1 percent to about 300 ppm:1 percent.

1 54. (New) The sludge of claim 48, wherein, the polymeric quaternary ammonium compound
2 comprises a molecular weight in the range of about 500,000 to about 3,000,000, and the
3 polyacrylamide comprises a molecular weight in the range of about 5,000,000 to about
4 15,000,000.

1 55. (Amended) A sludge composition comprising:
2 water;
3 a polyacrylamide;
4 a polymeric quaternary ammonium compound; and
5 solids comprising an agglomeration of microflocs of thermophiles wherein the thermophiles
6 comprise bacteria living at temperatures greater than about 115°F.

1 56. PLEASE CANCEL THIS CLAIM

1 57. PLEASE CANCEL THIS CLAIM

1 58. (Amended) The sludge of claim 55, wherein the polymeric quaternary ammonium
2 compound comprises at least one selected from the group consisting of di-allyl di-methyl

1 ammonium chloride (DADMAC) compounds and epichlorohydrin di-methyl amine
2 (epi-DMA).

1 59. (New) The sludge of claim 55, wherein a ratio of the polymeric quaternary ammonium
2 compound to the cationic polyacrylamide is in the range of about 1:10 to about 20:1.

1 60. (Amended) The sludge of claim 55, wherein a concentration of quaternary ammonium
2 compound and polyacrylamide to the percentage of solids in the sludge is in the range of
3 about 50 ppm:1 percent to about 300 ppm:1 percent.

1 61. (New) The sludge of claim 55, wherein, wherein the polymeric quaternary ammonium
2 compound comprises a molecular weight in the range of about 500,000 to about 3,000,000,
3 and the polyacrylamide comprises a molecular weight in the range of about 5,000,000 to
4 about 15,000,000.

62. PLEASE CANCEL THIS CLAIM

1 63. PLEASE CANCEL THIS CLAIM

1 64. PLEASE CANCEL THIS CLAIM

1 65. PLEASE CANCEL THIS CLAIM

1 66. PLEASE CANCEL THIS CLAIM

1 67. (New) A sludge composition comprising:
2 water;
3 thermophiles wherein the thermophiles comprise bacteria living at temperatures greater than
4 about 115°F; and
5 a polymeric quaternary ammonium compound.

1 68. (Amended) The sludge of claim 67 wherein the quaternary ammonium moiety comprises at
2 least one selected from the group consisting of di-allyl di-methyl ammonium chloride
3 (DADMAC) compounds and epichlorohydrin di-methyl amine (epi-DMA).

1 69. (New) The sludge of claim 67, wherein the polymer is present in an amount sufficient to form
2 microflocs of the thermophiles.

1 70. (New) The sludge of claim 67, wherein the polymer is present in an amount sufficient to
2 cause formation of the thermophiles into a developed microfloc system having a cationic
3 overcharge.

1 71. (Amended) The sludge of claim 67, wherein, wherein the polymeric quaternary ammonium
compound comprises a molecular weight in the range of at least about 5,000,000.